In the Claims:

1. (Currently amended) A plant cell comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase polypeptide that comprises an asymmetrically positioned homologous domain and that catalyzes the ~~position~~ production of an isoprenoid reaction product that is not produced when said domain is positioned at its naturally-occurring site in an isoprenoid synthase polypeptide, wherein the chimeric isoprenoid synthase polypeptide has a conserved amino acid sequence motif of DDXXD that is located in a different position in the chimeric isoprenoid synthase polypeptide than in the naturally-occurring isoprenoid synthase polypeptide, [[and]] wherein the chimeric isoprenoid synthase polypeptide folds into a tertiary structure that results in synthase activity, and wherein the chimeric isoprenoid synthase polypeptide includes therein a ratio-determinant domain that influences the relative ratio of reaction products generated by the chimeric isoprenoid synthase polypeptide.

2. (Previously presented) The plant cell of claim 1, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of at least two different isoprenoid reaction products.

3. (Previously presented) A plant cell comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase polypeptide selected from the group consisting of (a) the *tobacco-Hyoscyamus* CH4 chimeric isoprenoid synthase; (b) the *tobacco-Hyoscyamus* CH10 chimeric isoprenoid synthase; (c) the *tobacco-Hyoscyamus* CH11 chimeric isoprenoid synthase; (d) the *tobacco-Hyoscyamus* CH12 chimeric isoprenoid synthase; (e) the *tobacco-Hyoscyamus* CH13 chimeric isoprenoid synthase; and (f) the *tobacco-Hyoscyamus* CH14 chimeric isoprenoid synthase.

4. (Original) The plant cell of claim 1, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antifungal agent.

5. (Original) The plant cell of claim 1, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antibacterial agent.

6. (Original) The plant cell of claim 1, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antitumor agent.

7. (Previously presented) A transgenic plant comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase that comprises a domain from a first isoprenoid synthase joined to a domain from a second, different isoprenoid synthase, whereby said chimeric isoprenoid synthase polypeptide catalyzes the production of an isoprenoid reaction product that is not produced in the absence of said domain from said second, different isoprenoid synthase, wherein:

(a) said first isoprenoid synthase catalyzes the production of an isoprenoid reaction product of said first isoprenoid synthase, but does not catalyze the production of an isoprenoid reaction product of said second, different isoprenoid synthase;

(b) said second, different isoprenoid synthase catalyzes the production of an isoprenoid reaction product of said second, different isoprenoid synthase, but does not catalyze the production of an isoprenoid reaction product of said first isoprenoid synthase;

(c) said domain from said first isoprenoid synthase occupies a first position in said chimeric isoprenoid synthase polypeptide, said first position in said chimeric isoprenoid synthase polypeptide corresponding to a position in said first isoprenoid synthase occupied by said domain from said first isoprenoid synthase; and

(d) said domain from said second, different isoprenoid synthase occupies a second position in said chimeric isoprenoid synthase polypeptide, said second position in said chimeric isoprenoid synthase polypeptide corresponding to a position in said second, different isoprenoid synthase occupied by said domain from said second, different isoprenoid synthase, wherein the chimeric isoprenoid synthase polypeptide folds into a tertiary structure that results in synthase activity, and wherein the chimeric isoprenoid synthase polypeptide includes therein a ratio-determinant domain that influences the relative ratio of reaction products generated by the chimeric isoprenoid synthase polypeptide.

8. (Original) The transgenic plant of claim 7, wherein said chimeric isoprenoid synthase polypeptide catalyzes at least two different isoprenoid reactions.

9. (Previously presented) The transgenic plant of claim 7, wherein said domain from said second, different isoprenoid synthase comprises the ratio-determinant domain of said chimeric isoprenoid synthase polypeptide.

10. (Previously presented) The transgenic plant of claim 9, wherein said ratio-determinant domain of said chimeric isoprenoid synthase polypeptide determines the ratio of production of isoprenoid reaction products of said chimeric isoprenoid synthase polypeptide.

11. (Original) The transgenic plant of claim 7, wherein said domain from said first isoprenoid synthase is from a plant isoprenoid synthase and said domain from said second different isoprenoid synthase is from a plant isoprenoid synthase.

12. (Previously presented) A transgenic plant comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase polypeptide selected from the group consisting of (a) the *tobacco-Hyoscyamus* CH4 chimeric isoprenoid synthase; (b) the *tobacco-Hyoscyamus* CH10 chimeric isoprenoid synthase; (c) the *tobacco-Hyoscyamus* CH11 chimeric isoprenoid synthase; (d) the *tobacco-Hyoscyamus* CH12 chimeric isoprenoid synthase; (e) the *tobacco-Hyoscyamus* CH13 chimeric isoprenoid synthase; and (f) the *tobacco-Hyoscyamus* CH14 chimeric isoprenoid synthase.

13. (Original) The transgenic plant of claim 7, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antifungal agent.

14. (Original) The plant cell of claim 7, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antibacterial agent.

15. (Original) The plant cell of claim 7, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of an antitumor agent.

16. (Previously presented) A plant cell comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase that comprises a domain from a first isoprenoid synthase joined to a domain from a second, different isoprenoid synthase, whereby said chimeric isoprenoid synthase polypeptide catalyzes the production of an isoprenoid reaction product that is not produced in the absence of said domain from said second, different isoprenoid synthase, wherein:

(a) said first isoprenoid synthase catalyzes the production of an isoprenoid reaction product of said first isoprenoid synthase, but does not catalyze the production of an isoprenoid reaction product of said second, different isoprenoid synthase;

(b) said second, different isoprenoid synthase catalyzes the production of an isoprenoid reaction product of said second, different isoprenoid synthase, but does not catalyze the production of an isoprenoid reaction product of said first isoprenoid synthase;

(c) said domain from said first isoprenoid synthase occupies a first position in said chimeric isoprenoid synthase polypeptide, said first position in said chimeric isoprenoid synthase polypeptide corresponding to a position in said first isoprenoid synthase occupied by said domain from said first isoprenoid synthase; and

(d) said domain from said second, different isoprenoid synthase occupies a second position in said chimeric isoprenoid synthase polypeptide, said second position in said chimeric isoprenoid synthase polypeptide corresponding to a position in said second, different isoprenoid synthase occupied by said domain from said second, different isoprenoid synthase, wherein the chimeric isoprenoid synthase polypeptide folds into a tertiary structure that results in synthase activity, and wherein the chimeric isoprenoid synthase polypeptide includes therein a ratio-determinant domain that influences the relative ratio of reaction products generated by the chimeric isoprenoid synthase polypeptide.

17. (Previously presented) The plant cell of claim 16, wherein said domain from said second, different isoprenoid synthase comprises the ratio-determinant domain of said chimeric isoprenoid synthase polypeptide.

18. (Previously presented) The plant cell of claim 17, wherein said ratio-determinant domain of said chimeric isoprenoid synthase polypeptide determines the ratio of production of isoprenoid reaction products of said chimeric isoprenoid synthase polypeptide.

19. (Previously presented) The plant cell of claim 16, wherein said domain from said first isoprenoid synthase is from a plant isoprenoid synthase and said domain from said second different isoprenoid synthase is from a plant isoprenoid synthase.

20. (Previously presented) The plant cell of claim 2, wherein the isoprenoid reaction products are 5-epi-aristolochene and vetispiradiene.

21. (Previously presented) The plant cell of claim 2, wherein the chimeric isoprenoid synthase comprises:

(a) a first domain controlling the synthesis of a first isoprenoid reaction product;

(b) a second domain controlling the synthesis of a second isoprenoid reaction product; and

(c) a third domain located between the first and second domains, the third domain acting as the ratio-determinant domain and controlling the relative ratio of the first and second isoprenoid reaction products produced.

22. (Previously presented) The plant cell of claim 21, wherein the first domain controls the synthesis of a product produced by the activity of a synthase gene from tobacco that is TEAS.

23. (Previously presented) The plant cell of claim 21, wherein the second domain controls the synthesis of a product produced by the activity of a synthase gene from *Hyoscyamus* that is HVS.

24. (Currently amended) A transgenic plant comprising a nucleic acid molecule encoding a chimeric isoprenoid synthase polypeptide that comprises an asymmetrically positioned homologous domain and that catalyzes the ~~position~~ production of an isoprenoid reaction product that is not produced when said domain is positioned at its naturally-occurring site in an isoprenoid synthase polypeptide, wherein the chimeric isoprenoid synthase polypeptide has a conserved amino acid sequence motif of DDXXD that is located in a different position in the chimeric isoprenoid synthase polypeptide than in the naturally-occurring isoprenoid synthase polypeptide, [[and]] wherein the chimeric isoprenoid synthase polypeptide folds into a tertiary structure that results in synthase activity, and wherein the chimeric isoprenoid synthase polypeptide includes therein a ratio-determinant domain that influences the relative ratio of reaction products generated by the chimeric isoprenoid synthase polypeptide.

25. (Previously presented) The transgenic plant of claim 24, wherein said chimeric isoprenoid synthase polypeptide catalyzes the production of at least two different isoprenoid reaction products.

26. (Previously presented) The transgenic plant of claim 25, wherein the isoprenoid reaction products are 5-epi-aristolochene and vetispiradiene.

27. (Currently amended) The transgenic plant of claim 24, wherein the chimeric isoprenoid synthase comprises:

(a) a first domain controlling the synthesis of a first isoprenoid reaction product;

(b) a second domain controlling the synthesis of a second isoprenoid reaction product; and

(c) a third domain located between the first and second domains, the third domain acting as [[a]] the ratio-determinant domain and controlling the relative ratio of the first and second isoprenoid reaction products produced.

28. (Previously presented) The transgenic plant of claim 27, wherein the first domain controls the synthesis of a product produced by the activity of a synthase gene from tobacco that is TEAS.

29. (Previously presented) The transgenic plant of claim 27, wherein the second domain controls the synthesis of a product produced by the activity of a synthase gene from *Hyoscyamus* that is HVS.

30. (Previously presented) The plant cell of claim 1, wherein the DDXXD motif coordinates a metal cofactor that is necessary to neutralize the diphosphate moiety of farnesyl pyrophosphate in an otherwise lipophilic pocket.

31. (Previously presented) The transgenic plant of claim 7, wherein the DDXXD motif coordinates a metal cofactor that is necessary to neutralize the diphosphate moiety of farnesyl pyrophosphate in an otherwise lipophilic pocket.